09/701754
525 Rec'd PCT/PTO 01 DEC 2000

(Replacement for pages 1-8)

The zoom lens disclosed in JP-A-7-128619 corrects image movement caused by camera shake by moving a part of the third lens group vertically to the optical axis while the same lens group is fixed with respect to the image plane. This type of zoom lens is more favorable than a zoom lens of front-attachment type in view of downsizing, but a load on the actuator will be heavier since the lens group for correcting camera shake is composed of three lenses.

Since an optical system for correcting camera shake is attached in front of the zoom lens disclosed in JP-A-8-29737, the lens diameter of the optical system will be increased, and the entire component will be upsized. So a load on the driving system will be heavier, and thus, this zoom lens is unfavorable in view of downsizing, weight reduction and power-saving.

The latter zoom lens in JP-A-7-128619 is advantageous in downsizing and weight reduction when compared to a type comprising an optical system for correcting camera shake in front of the zoom lens, since a third lens group is fixed with respect to the image plane and a part thereof is moved vertically with respect to the optical axis. However, the zoom lens has a problem of deterioration in aberration, especially for chromatic aberration, when shifting lenses, since a part of the third lens group is moved.

Disclosure of Invention

A purpose of the present invention is to resolve the above mentioned problems in conventional zoom lenses by providing a small and compact zoom lens with less deterioration in the aberration performance and also a video camera using the same.

For this purpose, a first zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane, a second lens group having a negative refracting power and varying power by moving along an optical axis, a third lens group having a positive refracting power, being composed of two lenses: one positive lens and one negative lens comprising at least one aspherical surface, and being fixed with respect to the image plane, and a fourth lens group having a positive refracting power, comprising at least one aspherical surface and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a

reference surface, and the first to the fourth lens group are disposed from the object in this order. The present invention is characterized in that the entire third lens group is moved vertically with respect to the optical axis so as to correct movement of an image during camera shake. The shifting amount Y of the third lens group at a focal length f of an entire system when correcting camera shake, the shifting amount Yt of the third lens group at a telephoto end, and the focal length ft of the telephoto end satisfy the following conditional expressions.

$Yt>Y$; and

$(Y/Yt) / (f/ft)<1.5$

Accordingly, the zoom lens can be downsized when compared to a type of zoom lens comprising an optical system for correcting camera shake attached in front of the lens. Furthermore, since the entire group having a united optical performance is decentered, deterioration in the aberration can be decreased when compared to a zoom lens in which only a part in the groups are moved. Furthermore, since the third lens group is composed of two lenses: a positive lens and a negative lens, the aberration when correcting camera shake can be corrected more efficiently, and deterioration of image quality can be decreased even when correcting camera shake. Since the third lens group is composed of at least one aspherical surface, aberration when correcting camera shake can be corrected with further efficiency, and thus, performance when moving the lenses can be improved.

Furthermore, since the fourth lens group comprises at least one aspherical surface, aberration at correcting camera shake can be corrected as well as at a stationary state with further efficiency. In addition to that, deterioration in the optical performance can be prevented when camera shake occurs by satisfying the above-mentioned expressions.

Preferably in the first zoom lens, a focal length f3 of the third lens group and a focal length fw of an entire system at a wide-angle end satisfy the following conditional expression.

$2.0 < f3/fw < 4.0$

Accordingly, the shifting amount when correcting camera shake can be decreased and the zoom lens can be shortened as a whole, and thus, a small zoom lens can be provided.

Preferably, a surface on the object side of a lens disposed closest to the object side in the third lens group is aspherical, and a local radius of curvature R10 in the vicinity of an optical axis and a local radius of curvature R11 in an

outer peripheral portion satisfy the following conditional expression.

$$1.05 < R11/R10 < 2.5$$

Accordingly, spherical aberration can be corrected satisfactorily.

Preferably, a surface on the object side of a lens disposed closest to the object side in the fourth lens group is aspherical, and a local radius of curvature R20 in the vicinity of an optical axis and a local radius of curvature R21 in an outer peripheral portion satisfy the following conditional expression.

$$1.05 < R21/R20 < 2.5$$

Accordingly, coma-aberration on the upper flux of the off-axis ray can be corrected favorably.

Next, a first video camera of the present invention is characterized in that it includes the above-mentioned first zoom lens. Accordingly, the video camera has a function to correct camera shake and can be downsized and weight-reduced.

Next, a second zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fifth lens groups are disposed from the object side in this order. The third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. The third lens group comprises a convex lens having an aspherical surface when viewed from the object side, and a local radius of curvature rS1 for a diameter occupying 10% of lens effective diameter and a local radius of curvature rS9 for a diameter occupying 90% of lens effective diameter satisfy the following conditional expression.

$$0.01<rS1/rS9<2.00$$

In such a zoom lens, camera shake is corrected by moving lenses with smaller diameter. Therefore, this type of zoom lens is favorable in downsizing when compared to a zoom lens comprising an optical system for correcting camera shake attached in front of the lens. Moreover, since the

aberration performance for each lens group can be adjusted, the aberration performance will deteriorate less when correcting camera shake. In such a zoom lens, long back focus can be secured easily since the fourth lens group includes lenses having a negative refracting power. This is suitable for an optical system of a video camera using three imaging devices, which requires a long back focus. Furthermore, sufficient aberration performance can be obtained by satisfying the above-mentioned conditional expression.

In the second zoom lens, preferably, the third lens group is composed of two lenses: one positive lens and one negative lens.

Preferably, the fourth lens group is composed of two lenses separated from each other: one positive lens and one negative lens.

Preferably, the fourth lens group is composed of two cemented lenses: one positive lens and one negative lens.

Preferably, the third lens group is composed of two lenses: one lens having a positive refracting power and one lens having a negative refracting power being disposed separately from the object side in this order, and the lenses have sag amounts equal on the object side and on the image side.

Preferably, the third lens group is composed of three lenses comprising at least one positive lens and at least one negative lens. In a small zoom lens, the third lens group is required to have a strong positive power to decrease the whole length. Aberrations occurring at this time can be corrected by using three lenses in this embodiment.

Preferably, the third lens group is composed of one lens. Accordingly, a load on the driving system will be lighter when correcting camera shake and power consumption can be decreased.

Preferably, the third lens group comprises at least one aspherical surface. Such a zoom lens can have improved performance during lens shifting.

It is also preferable that the shifting amount Y of the third lens group at a focal length f of an entire system when correcting camera shake, the shifting amount Yt of the third lens group at a telephoto end and a focal length ft of the telephoto end satisfy the following conditional expressions.

$Yt>Y$; and

$(Y/Yt) / (f/ft)<1.5$

Accordingly, overcorrection and also deterioration in the optical performance can be prevented.

Next, a second video camera of the present invention is characterized

in that it comprises the second zoom lens. Accordingly, a small video camera with high-performance and a function to correct camera shake is obtainable.

Next, a third zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power, comprising at least one aspherical surface, being composed of at least three lenses including at least one positive lens and at least one negative lens, and being fixed with respect to the image plane; a fourth lens group having a positive refracting power, comprising at least one aspherical surface and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fourth lens groups are disposed from the object side in this order. The entire third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. The shifting amount Y of the third lens group at a focal length f of an entire system when correcting camera shake, the shifting amount Yt of the third lens group at a telephoto end, and the focal length ft of the telephoto end satisfy the following conditional expressions.

$Yt>Y$; and

$(Y/Yt) / (f/ft)<1.5$

This type of zoom lens is favorable in downsizing when compared to a zoom lens comprising an optical system for correcting camera shake attached in front of the lens. Since a whole lens group of a united optical performance is decentered, deterioration in aberration can be decreased when compared to a type of zoom lens where a part of lenses in a group is moved. The third lens group is required to have a strong positive power to decrease the full length in order to obtain a small zoom lens. In this preferable embodiment, aberration occurring at this time can be corrected with the three lenses.

Preferably, the third lens group is composed of at least one aspherical surface. Accordingly, aberration when correcting camera shake can be corrected with further efficiency, and thus, performance when moving the lenses can be improved. Preferably the fourth lens group comprises at least one aspherical surface. Accordingly, aberration when correcting camera shake can be corrected as well as when a stationary state with further efficiency. In addition to that, deterioration in the optical performance can be

prevented by satisfying the above-mentioned expressions when camera shake occurs.

It is also preferable that the third lens group includes a positive lens, and a cemented lens of a positive lens and a negative lens. Accordingly, tolerance when assembling a group of correcting lenses can be eased.

Preferably, a focal length f3 of the third lens group and a focal length fw of an entire system at a wide-angle end satisfy the following conditional expression.

$2.0 < f3/fw < 4.0$

Accordingly, the shifting amount when correcting camera shake can be decreased and the zoom lens can be shortened as a whole, and thus, a small zoom lens can be provided.

Preferably, a surface on the object side of a lens disposed closest to the object side in the third lens group is aspherical, and a local radius of curvature R10 in the vicinity of an optical axis and a local radius of curvature R11 in an outer peripheral portion satisfy the following conditional expression.

$1.05 < R11/R10 < 2.5$

Accordingly, spherical aberration can be corrected satisfactorily.

Preferably, a surface on the object side of a lens disposed closest to the object side in the fourth lens group is aspherical, and a local radius of curvature R20 in the vicinity of an optical axis and a local radius of curvature R21 in an outer peripheral portion satisfy the following conditional expression.

$1.05 < R21/R20 < 2.0$

Accordingly, coma-aberration on the upper flux of the off-axis ray can be corrected favorably.

Preferably, the fourth lens group is composed of one positive lens.

Next, a third video camera of the present invention is characterized in that it includes the above-mentioned third zoom lens. Accordingly, the video camera has a function to correct camera shake and can be downsized and weight-reduced.

Next, a fourth zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with

respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fifth lens groups are disposed from the object side in this order. The third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. The third lens group and the fourth lens group are composed two lenses respectively, and Abbe's number $\nu 31$ of one lens of the third group, Abbe's number $\nu 32$ of the remaining lens of the third group, Abbe's number $\nu 41$ of one lens of the fourth group and Abbe's number $\nu 42$ of the remaining lens of the fourth group satisfy the following conditional expressions.

$$|\nu 31 - \nu 32| > 25$$

$$|\nu 41 - \nu 42| > 25$$

Since such a zoom lens can provide a sufficient achromatic effect, deterioration in magnification chromatic aberration can be decreased even when shifting the lenses.

Next, a fifth zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fifth lens groups are disposed from the object side in this order. The third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. A focal length f3 of the third lens group and a focal length f34 of a composite focal length of the third and fourth lens groups satisfy the following conditional expression.

$$0.40 < |f3/f34| < 0.85$$

Since such a zoom lens satisfying the above expression can control the power of the correcting lenses, deterioration in the aberration performance can be prevented and moreover, degree of lens movement when correcting camera shake can be controlled. Therefore, the lens can be made smaller, and this is

favorable for downsizing.

Next, a sixth zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fifth lens groups are disposed from the object side in this order. The third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. A focal length fw of an entire system at the wide-angle end and a distance BF between the final surface of the lens and the image plane in the air satisfy the following conditional expression.

$$2.0<BF<fw<5.0$$

Accordingly, a zoom lens with a long back focus can be provided.

Next, a seventh zoom lens of the present invention comprises a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface. In this zoom lens, the first to the fifth lens groups are disposed from the object side in this order. The third lens group is moved vertically with respect to the optical axis so as to correct movement of the image during camera shake. A focal length fw of an entire system at the wide-angle end, focal length fi (i=1-5) of the i-th lens group, and a composite focal length f34 of the third and fourth lens groups satisfy the following expressions.

$$5.0<f1/fw<8.0$$

$$0.5<|f2|/fw<1.6$$

$$4.0<f34/fw<9.5$$

$2.0<f5/fw<5.0$

Accordingly, a small zoom lens can be provided.

Next, a fourth video camera of the present invention is characterized in that it comprises any one of the fourth to seventh zoom lenses. Accordingly, a small video camera with high-performance and a function to correct camera shake is obtainable.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing the arrangement of a zoom lens in a first embodiment according to the present invention.

FIG. 2 illustrates various aberrations at a wide-angle end in the first embodiment according to the present invention.

FIG. 3 illustrates various aberrations at a standard position in the first embodiment according to the present invention.

FIG. 4 illustrates various aberrations at a telephoto end in the first embodiment according to the present invention.

FIG. 5 is a view showing the arrangement of a zoom lens in a second embodiment according to the present invention.

FIG. 6 illustrates various aberrations at a wide-angle end in the second embodiment according to the present invention.

FIG. 7 illustrates various aberrations at a standard position in the second embodiment according to the present invention.

FIG. 8 illustrates various aberrations at a telephoto end in the second embodiment according to the present invention.

FIG. 9 is a view showing the arrangement of a zoom lens in a third embodiment according to the present invention.

FIG. 10 illustrates various aberrations at a wide-angle end in the third embodiment according to the present invention.

FIG. 11 illustrates various aberrations at a standard position in the third embodiment according to the present invention.

FIG. 12 illustrates various aberrations at a telephoto end in the third embodiment according to the present invention.

FIG. 13 is a view showing the arrangement of a zoom lens in a fourth embodiment according to the present invention.

FIG. 14 illustrates various aberrations at a wide-angle end in the fourth embodiment according to the present invention.

9. A zoom lens according to claim 1, wherein a focal length f3 of the third lens group and a focal length fw of an entire system at a wide-angle end satisfy the following conditional expression

$2.0 < f3/fw < 4.0$.

10. A zoom lens according to claim 1, wherein a surface on the object side of a lens disposed closest to the object side in the third lens group is aspherical, and a local radius of curvature R10 in the vicinity of an optical axis and a local radius of curvature R11 in an outer peripheral portion satisfy the following conditional expression

$1.05 < R11/R10 < 2.5$.

11. A zoom lens according to claim 1, wherein a surface on the object side of a lens disposed closest to the object side in the fourth lens group is aspherical, and a local radius of curvature R20 in the vicinity of an optical axis and a local radius of curvature R21 in an outer peripheral portion satisfy the following conditional expression

$1.05 < R21/R20 < 2.0$.

12. A video camera provided with a zoom lens of any one of claims 1, 9, 10 or 11.

13. (Amended) A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface,

the first, second, third, fourth and fifth lens groups being disposed from the object side in this order,

wherein the third lens group is moved vertically with respect to the optical

axis so as to correct movement of an image during camera shake, and the third lens group comprises a convex lens having an aspherical surface when viewed from the object side, and a local radius of curvature rS1 for a diameter occupying 10% of a lens effective diameter and a local radius of curvature rS9 for a diameter occupying 90% of a lens effective diameter satisfy the following conditional expression

$$0.01<rS1/rS9<2.00.$$

14. A zoom lens according to claim 13, wherein the third lens group is composed of two lenses: one positive lens and one negative lens.

15.

16. A zoom lens according to claim 13, wherein the fourth lens group is composed of two lenses separated from each other: one positive lens and one negative lens.

17. A zoom lens according to claim 13, wherein the fourth lens group is composed of two cemented lenses: one positive lens and one negative lens.

18.

19. (Cancelled)

20. A zoom lens according to claim 13, wherein the third is composed of two lenses: one lens having a positive refracting power and one lens having a negative refracting power being disposed separately from the object side in this order, and the lenses have sag amounts equal in the object side and in the image side.

21. A zoom lens according to claim 13, wherein the third lens group is composed of three lenses comprising at least one positive lens and at least one negative lens.

22. A zoom lens according to claim 13, wherein the third lens group is composed of one lens.

23. A zoom lens according to claim 13, wherein the third lens group comprises at least one aspherical surface.

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. A zoom lens according to claim 13, wherein a shifting amount Y of the third lens group at a focal length f of an entire system when correcting camera shake, a shifting amount Yt of the third lens group at a telephoto end and a focal length ft of the telephoto end satisfy the following conditional expressions

$Yt>Y;$

$(Y/Yt) / (f/ft)<1.5.$

29. (Amended) A video camera provided with a zoom lens of any one of claims 13, 14, 16, 17, 20, 21, 22, 23 or 28.

30. A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power, composed of three lenses that comprise at least one positive lens and at least one negative lens and that comprise at least one aspherical surface, and fixed with respect to the image plane; and a fourth lens group having a positive refracting power, comprising at least one aspherical surface and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface,
the first, second, third and fourth lens groups being disposed from the object side in this order,
wherein the entire third lens group is moved vertically with respect to the optical axis so as to correct a movement of an image during camera shake; and a shifting amount Y of the third lens group at a focal length f of an entire

system when correcting camera shake, a shifting amount Yt of the third lens group at a telephoto end, and a focal length ft of the telephoto end satisfy the following conditional expressions

$Yt>Y$; and

$(Y/Yt) / (f/ft)<1.5$.

31. A zoom lens according to claim 30, wherein the third lens group comprises a positive lens, and a cemented lens of a positive lens and a negative lens.

32. A zoom lens according to claim 30, wherein a focal length f3 of the third lens group and a focal length fw of an entire system at a wide-angle end satisfy the following conditional expression

$2.0 < f3/fw < 4.0$.

33. A zoom lens according to claim 30, wherein a surface on the object side of a lens disposed closest to the object side in the third lens group is aspherical, and a local radius of curvature R10 in the vicinity of an optical axis and a local radius of curvature R11 in an outer peripheral portion satisfy the following conditional expression

$1.05 < R11/R10 < 2.5$.

34. A zoom lens according to claim 30, wherein a surface on the object side of a lens disposed closest to the object side in the fourth lens group is aspherical, and a local radius of curvature R20 in the vicinity of an optical axis and a local radius of curvature R21 in an outer peripheral portion satisfy the following conditional expression

$1.05 < R21/R20 < 2.0$.

35. A video camera provided with a zoom lens of any one of claims 30 to 34.

36. (New) A zoom lens according to claim 30, wherein the fourth lens group is composed of one positive lens.

37. (New) A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens

group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface, the first, second, third, fourth and fifth lens groups being disposed from the object side in this order,
wherein the third lens group is moved vertically with respect to the optical axis so as to correct movement of an image during camera shake, the third lens group and the fourth lens group are composed of two lenses respectively, and Abbe's number $\nu 31$ of one lens of the third group, Abbe's number $\nu 32$ of the remaining lens of the third group, Abbe's number $\nu 41$ of one lens of the fourth group and Abbe's number $\nu 42$ of the remaining lens of the fourth group satisfy the following conditional expressions

$$|\nu 31-\nu 32|>25$$
$$|\nu 41-\nu 42|>25.$$

38. (New) A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface, the first, second, third, fourth and fifth lens groups being disposed from the object side in this order,
wherein the third lens group is moved vertically with respect to the optical axis so as to correct movement of an image during camera shake, and a focal length f3 of the third lens group and a focal length f34 of a composite focal length of the third and fourth lens group satisfy the following conditional expression

$$0.40<|f3/f34|<0.85.$$

39. (New) A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface, the first, second, third, fourth and fifth lens groups being disposed from the object side in this order,
wherein the third lens group is moved vertically with respect to the optical axis so as to correct movement of an image during camera shake, and a focal length fw of an entire system at the wide-angle end and a distance BF between the final surface of the lens and the image plane in the air satisfy the following conditional expression

$$2.0<BF<fw<5.0.$$

40. (New) A zoom lens, comprising: a first lens group having a positive refracting power and being fixed with respect to an image plane; a second lens group having a negative refracting power and varying power by moving along an optical axis; a third lens group having a positive refracting power and being fixed with respect to the image plane; a fourth lens group having a negative refracting power and being fixed with respect to the image plane; and a fifth lens group having a positive refracting power and moving along an optical axis so as to keep the image plane varied by a shift of the second lens group and an object at a predetermined position from a reference surface, the first, second, third, fourth and fifth lens groups being disposed from the object side in this order,
wherein the third lens group is moved vertically with respect to the optical axis so as to correct movement of an image during camera shake, and a focal length fw of an entire system at the wide-angle end, focal length fi (i=1-5) of the i-th lens group, and a composite focal length f34 of the third and fourth lens groups satisfy the following expressions

$$5.0<f1/fw<8.0$$
$$0.5<|f2|/fw<1.6$$
$$4.0<f34/fw<9.5$$

$2.0 < f5/fw < 5.0$.

41. (New) A video camera provided with a zoom lens of any one of claims 37 to 40.